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(54) Work abrading member, particularly honing member and method for attaching abrasive particles on such a member

Schleifkörper, insbesondere Honkörper, und Verfahren, um Schleifpartikel auf solch einem Körper anzubringen

Corps abrasif, en particulier corps de honage et méthode pour faire adhérer des particules abrasives sur un tel corps

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Description

The invention relates to a work abrading member, particularly honing member having an outer surface with abrasive particles attached thereto over a portion of a length thereof, said abrasive particles defining the work engaging portion of said member. A member according to the preamble of claim 1 is known, for example, from GB-A-2038214.

The invention concerns also the use of a material as a coating over the non-abrasive work engaging surface of a honing guide assembly.

The invention relates further to a method for attaching abrasive particles onto the surface of a work abrading member, particularly a honing member, by attaching said abrasive particles to the surface of the member so as to establish a predetermined bond therebetween. A method according to the preamble of claim 10 is known from the document mentioned above.

The abrasive portion of a honing tool is the working portion of the tool as it is this portion of the tool which engages a particular workpiece under pressure during a honing operation and removes material therefrom until the desired final diameter of the workpiece has been achieved. As stock is being removed from a workpiece during a honing operation, metal chips and shavings have a tendency to load or stack up between the protruding abrasive particles on the honing tool, such build-up eventually leading to galling or scoring of the honed work surface. This is a continuing and on-going problem in many honing operations and the accumulation or adherence of such stock material between the abrasive particles is particularly true of ductile type materials such as stainless steel which produce long stringy chips or shavings during the honing process. Typically, such long stringy chips will fill up or clog the spaces between the protruding abrasive particles on the tool and then, after they have been hardened by compaction through the honing action itself, enough heat is eventually generated during honing that these chips or shavings will actually weld and bond themselves to the bonding matrix between the adjacent abrasive particles thereby causing galling or scoring of the honed work surface as the honing operation continues. Also, this stock material build-up reduces the cutting effectiveness of the abrasive particles and, once the abrasive particles wear to the same surface level as the stock build-up between such particles, any effective cutting action is eliminated. This phenomena therefore not only diminishes the quality of the finished work product but it also diminishes the overall service life of the tool and eventually leads to the termination of such tool as an effective cutting member.

Various means have been utilized in an effort to reduce and minimize the occurrence of having stock material build-up and collect between the abrasive particles of a honing tool thereby causing the aforementioned problems. For example, U.S. - A 4,155,721 discloses a dual bonding process for making single layered grinding tools wherein a metallic substrate is pre-etched so as to suitably cavitate the substrate surface prior to plating. Etching is believed to create small cavities in the substrate surface, each such cavity being adapted to individually receive a portion of an abrasive particle. This arrangement provides a stronger mechanical bond between the abrasive particles and the metal plated surface of the substrate so that at least a portion of the abrasive particles are recessed below the shear plane. This process further includes a second plating step wherein a second metallic bond matrix can thereafter be applied over the first metal coating to prevent stock build-up and adherence to the bond matrix between the abrasive particles. This second plating bath is comprised of metal ions only and, when the type and thickness of this second coating of metal is properly selected for the intended application of the tool, this second coating of metal between the abrasive particles helps to prevent glazing of the cutting edge of the tool due to the same stock build-up between the abrasive particles as previously explained.

U.S. - A 4,832,707; 4,973,338; and 4,868,069 likewise disclose various metal-bonded tools and methods for manufacturing the same including various anti-static and abrasion-resistant coatings for use with such abrasive products to decrease the incidences of stock build-up between the abrasive particles thereby improving the overall quality of the finished work product, including grinding efficiency and finishing accuracy. More particularly, U.S. Patent No. 4,832,707 discloses a method of manufacturing a metal-bonded tool which uses diamond particles as the abrasive material for high efficiency grinding. This patent specifically addresses the problem associated with the grinding chips accumulating in the hollows formed within the bond holding the abrasive particles to the particular substrate and attempts to solve such problem by regulating the quantity of the carbon or graphite and the size of such precipitates in the bond.

U.S. - A 4,973,338 likewise attempts to reduce the incidence of build-up or clogging of the abrasive surface by treating the coated abrasive materials with an appropriate amount of a quaternary ammonium anti-static compound comprising about 15 to about 35 carbon atoms in a molecular weight not less than about 300. It has been found that coated abrasive materials, thus treated, have a combination of anti-static, lubricity and anti-loading characteristics which provide improved abrading efficiency and longer abrading life.

U.S. - A 4,868,069 discloses a method for improving the abrasion resistance of various substrates wherein the substrate is coated with a relatively soft metal matrix in which abrasion-resistant grit particles are embedded. The coating comprises abrasion-resistant particles that protrude from a metal matrix having a surface that is hardened relative to the bulk of the metal matrix, the coating being metallurgically bonded to the substrate. Embedding grit particles in the hardened coating prevents the grit particles from dislodging and it

also prevents catastrophic cracks from developing in the coating.

Although all of the above-identified known prior art processes appear to address a similar type problem, namely, accumulation and adherence of stock build-up between the abrasive particles in the substrate as well as the destruction or plastic deformation of the bond therebetween with a resultant deterioration of finishing accuracy and quality, none of the known processes include the use of a nickel/Teflon or other metal or metal alloy composite material having a lubricant type substance occluded therewithin as an anti-galling agent for applying to and coating over the top of the bond already established between the plated abrasive particles on a honing tool as previously explained. The self-lubricating or friction reducing characteristics associated with Teflon particles or other suitable lubricating agents as will be hereinafter further explained in combination with the nickel or other metal or metal alloy material contained in the composite coating material produces both an anti-stick, anti-galling coating surface as well as a strong, abrasive resistant coating which adheres to and becomes part of the underlying bond and is capable of withstanding the forces and stresses of a honing operation without destruction and/or deformation. For these and other reasons, the present process differs both composition wise and application wise from the bonding processes disclosed in the known prior art.

It is the object of the invention to improve the work abrading member and to provide a method such that a substantially smooth, anti-stick, anti-gall bonding surface is made which prevents metal chips and shavings produced during abrading operation from building up and collecting on the surface.

This object is achieved with the work abrading member according to claim 1, the use of a composite material according to claim 9, and, respectively, a method according to claim 10.

Preferred embodiments of the invention are defined in the dependent claims.

The invention is further described in conjunction with the accompanying drawings.

Fig. 1 is a side-elevational view of one embodiment of a typical honing mandrel including a tubular honing member and an expander member which is slidably movable therewithin;

Fig. 2 is a side-elevational view illustrating the first plating process associated with the present invention;

Fig. 3 is a side-elevational view illustrating the second plating process associated with the present invention;

Fig. 4 is a side-elevational view illustrating the third plating process associated with the present invention;

Fig. 5 is an enlarged, partial side-elevational view showing the bond matrix between two adjacent abrasive particles of Fig. 4;

Fig. 6 is an enlarged, partial cross-sectional view taken along line 6-6 of Fig. 1 illustrating the bonding of an abrasive material onto the working portion of a honing tool in accordance with the teachings of the present invention; and

Fig. 7 is a cross-sectional view of one embodiment of another honing mandrel wherein the present invention also has particular utility, the honing mandrel being shown in operative position in a cylinder to be honed.

Fig. 1 shows a typical honing tool or mandrel 10 commonly used for attachment to a honing machine to accomplish a honing operation. The honing tool or mandrel 10 includes an elongated substantially tubular honing member 12 having a passageway or bore (not shown) extending therethrough from end-to-end adaptable for cooperatively receiving an expander member or arbor 14 positioned therethrough. The honing member 12 includes an outer surface 16, preferably substantially cylindrical, a portion 18 of which is typically plated with a super abrasive material as illustrated in Fig. 1. Such super abrasive materials typically include diamond particles or particles of cubic boron nitride in a suitable binder or other like hard materials. Use of such super abrasive materials is well known in the honing art. Typically, only a portion of the honing tool is plated with such abrasive particles and the specific arrangement and amount of coverage of such abrasive particles on a particular honing tool is usually dependent upon the particular application and the surface finish desired after honing. Although a specific abrasive configuration is illustrated in Fig. 1, it is recognized that a wide variety of different abrasive patterns may be utilized depending upon the particular application desired and the type of super abrasive material being used. Nevertheless, regardless of the specific arrangement and amount of coverage of a particular super abrasive material, the present invention is directed specifically and particularly to an improved process for plating such super abrasive particles onto the working portion of the honing tool such as the abrasive portion 18 illustrated in Fig. 1. Other honing tool or mandrel constructions for which the present invention is likewise particularly useful are those single pass through honing tool constructions disclosed in US - A 4,197,680 and 4,253,279 as well as a variety of radially expandable mandrel constructions such as the construction illustrated in Fig. 7. Other radially expandable mandrel constructions having particluar utility for the present invention include those constructions disclosed in US - A 3,216,155; 4,524,549; and 4,555,875.

More specifically, the present improved process or method utilizes a nickel/phosphorous/Teflon (Ni-P-PTFE) composite material, or other metal or metal alloy material having a friction reducing or surface lubricating type material occluded or otherwise associated therewith, as the anti-galling agent for applying to and coating the bond established between the plated abrasive

particles and the honing tool once such particles are bonded by known techniques to such tool. Although any suitable means for attaching or bonding the abrasive particles to the tool substrate may be utilized without impairing the teachings of the present invention, an electroplated process is generally preferred. In this regard, multi-layers of a super abrasive material such as diamond particles and/or cubic boron nitride particles are positioned and held against the tool substrate and an initial thin layer of an electroplated material is applied thereagainst using known techniques in order to hold and attach the adjacent first layer of particles to the substrate. The results of this first plating process or bath are illustrated in Fig. 2 wherein multi-layers of a super abrasive grit 20 are held against the tool substrate 22 and an initial thin bond of electroplated material 24 is formed by and between the first adjacent layer of abrasive grit particles 21 and the tool substrate 22. Well known electro plating processes are available for accomplishing this task. Electroplated materials typically used for this type of bond application include such metals as nickel, copper, cobalt and chromium; such metal alloys as nickel phosphorous, nickel boron and brass; and other materials including autocatalytic or electroless plating. Autocatalytic plating refers to a process wherein the deposit material itself catalyzes the reduction reaction at the tool surface.

After this first initial electroplated or electroless plated process is applied to the particular abrasive particles and the associated substrate, the adjacent first layer of particles such as the particles 21 illustrated in Fig. 2 is only loosely secured or bonded to the substrate 22. In other words, this initial bond 24 covers only a very small portion of the overall height of the individual abrasive particles forming the adjacent layer. Once this first plating process is completed, the surplus layers of abrasive particles 20 (Fig. 2) are thereafter removed by known means and the plating process or bath is re-activated and a thicker plated deposit is applied to the initial bond 24 illustrated in Fig. 2 thereby further bonding the first layer of abrasive particles 21 to the substrate 22. This re-activation of the plating process (second plating process) allows additional electroplated material 26 to be applied to the previous bond 24 to build-up the bond between such particles and the substrate 22. In this regard, use of the term "bond" in describing the present process refers to a mechanical bond, not a chemical or metallurgical bond. The plated deposit material produces a close fitting socket that fills into the irregular abrasive grit surface to attach such abrasive grit to the tool substrate. The results of this second plating process are illustrated in Fig. 3.

This second plating operation helps to fill the voids between the abrasive particles 21 and the substrate 22 so as to build-up the bond therebetween as illustrated in Figs. 3 and 5. Normally, a suitable bond between the abrasive particles and the substrate is achieved when the space between adjacent particles is filled with the bonding agent to a point somewhere between 50% and 90% of the particle height. Referring to Figs. 2 and 3, it can be seen that the overall height of the bond (24 and 26) between the abrasive particles 21 illustrated in Fig. 3 is greater than the overall height of the initial bond 24 illustrated in Fig. 2. It is recognized that the above-described plating process can be re-activated and continued until the overall desired bond height is achieved. This portion of the present process just described is one of the known methods presently used for bonding super abrasive particles to a particular honing tool.

The main improvement of the present process as compared to the known processes for plating super abrasive materials onto a particular substrate lies in the use of a nickel/phosphorous/Teflon (Ni-P-PTFE) or other equivalent type material as an anti-galling agent which is coated or plated over the appropriate finished bond necessary for attaching the super abrasive particles to the particular substrate. The present method for plating the super abrasive particles to a particular substrate therefore modifies the above-explained known process as follows. Instead of completing the plating and bonding process to the desired bonding height, the plating process described above is stopped at least a coating thickness, typically about 5 μm to about 13 μm, short of the desired bond thickness and, at this point, a third plating process is activated and a relatively thin deposit of nickel/phosphorous/Teflon or other equivalent type material as will be hereinafter explained is plated or applied over the top of the bond already established between the abrasive particles 21 and the substrate 22 illustrated in Fig. 3. The results of this third plating process are illustrated in Fig. 4 and, more particularly, in the enlarged, partial side-elevational view illustrated in Fig. 5. As best shown in Fig. 5, this additional layer or coating 28 of a nickel/phosphorous alloy material includes micron-sized Teflon particles occluded therein to provide anti-stick and anti-gall properties to the bond. The anti-galling composite coating 28 applied over the known bond (24 and 26) is typically about 5 μm to about 13 μm thick so that the overall bond thickness will remain approximately the same as compared to known bonding techniques.

It is important to note that a wide variety of other metals and metal alloys as well as other surface friction reducing or lubricating type materials may be utilized as the composite anti-galling coating material depending upon the construction of the particular honing tool and the characteristics of the honing application. For example, any of the well known metals and alloys capable of being joined to a metal substrate can be used in the practice of the present invention. Alloys such as nickel-phosphorus compositions, nickel-boron compositions, nickel-chromium compositions, nickel-tungsten compositions, and other nickel based alloys are particularly useful. Various metallic carbides such as tungsten carbide, chromium carbide and other metallic carbides can likewise be used. For certain applications, pure metals such as chromium, nickel, copper, cobalt, or aluminum may also be used.

With respect to the lubricating or friction reducing agent in the anti-galling composite material, this agent may be any composition which can be occluded in metal or metal alloys and which can form at least a semi-continuous lubricating type surface to which the abraded stock material from a honing operation will not agglomerate. Such compositions may be polymers such as the preferred polymer polytetrafluoroethylene (Teflon), or such compositions may be silcone polymers, acrylonitrile polymers and copolymers, polyamides, polycarbonates, polymers and copolymers of polyoelfins such as ethylene, propylene and butylene, butadiene-styrene copolymers and other known polymeric materials. Also, natural lubricants such as graphite, mica and so forth may be used. Molybdenum disulphide will also work in the practice of the present invention. Thus, particles from any material which can be co-deposited with metal particles from a plating solution and which will lower the friction coefficient of the coating surface so as to form a smooth, slick surface, which smooth, slick surface is sometimes referred to herein as a lubricating surface, may be used in the practice of the present invention.

Although it is preferred that the third plating process be an electroless plating process, any suitable means including an electroplating process may be utilized to plate the anti-galling agent over the bond already established between the abrasive particles and the substrate. It is also recognized that any number of coatings of the friction reducing, anti-galling agent can be applied over the known bond to achieve any desired bond height.

Testing has verified and demonstrated that the present improved process for plating super abrasive materials onto a honing tool prevents the metal chips and shavings produced during a honing operation from building up and collecting between the abrasive particles. This is true because of the friction reducing or lubricating characteristics associated with the Teflon particles occluded within the nickel/phosphorous alloy or other suitable equivalent type anti-stick, anti-gall coating material. The respective size of the metallic and lubricating particles in the present coating as well as the respective proportions thereof result in a surface having at least a semi-continuous plane of lubricating material which functions as a lubricating surface to which the metal chips and shavings produced during a honing operation do not adhere. Generally the size of the metal particles will range from about 0.5 microns to about 80 microns in diameter and the size of the lubricating or friction reducing particles will range from about 0.1 microns to about 10 microns in diameter, the preferred particle size being about 1-2 microns in diameter. Best results can be achieved when the lubricating or friction reducing particles range from about 10% to about 25% of the entire anti-galling coating composition, which composition includes the deposited metal or metal alloy particles and the deposited lubricating or friction reducing particles. The use and application of this very specific composite material coating as explained above substantially eliminates the above-identified problems of galling and scoring of the particular workpiece and of the abrasive bond during honing.

Fig. 6 is an enlarged, partial cross-sectional view taken through the working portion 18 of the honing member 12 of Fig. 1 illustrating the resultant bond 30 between the super abrasive particles 21 and the honing member 12 produced in accordance with the teachings of the present process. The micron-sized Teflon particles occluded within the coating 28 (Fig. 5) provide a substantially smooth, anti-stick, anti-gall surface which prevents the metal chips and shavings produced during a honing operation from building up, collecting and welding or otherwise bonding themselves onto such surface between the abrasive particles. Also, although the present process has been described as a three-step bonding and coating process wherein the third coating process involves applying a nickel/phosphorous/Teflon composite coating or other equivalent composite coating over the top of the double bond established between the abrasive particles and the honing tool, it is recognized that any number of plating steps may be utilized to achieve the desired bond between the abrasive particles and the particular substrate, and any number of plating processes may be utilized to achieve the desired anti-stick, anti-galling coating thickness. It is also recognized that the above-described process may likewise be utilized for plating any abrasive material, not necessarily a super abrasive material, onto a honing tool or other substrate.

Fig. 7 illustrates one embodiment 32 of many possible embodiments of a typical radially expandable type honing mandrel construction for which the present invention likewise has particular utility. The honing mandrel 32 utilizes a plurality of circumferentially spaced work engaging members such as the stone assemblies 34 and the shoe or guide assemblies 36, one or more of such work engaging members 34 and 36 being radially adjustable during a particular honing operation to maintain the stone and/or guide assemblies in contact under pressure with a work surface being honed such as the cylindrical work piece 40. In such constructions, the stone assemblies perform the honing or grinding operations while the shoe or guide assemblies stabilize the mandrel and provide support for the stone assemblies. Many known stone and guide assemblies and stone and guide assembly movement means have been devised and used to accomplish this task. In the mandrel construction 32 illustrated in Fig. 7, a rack and pinion gear arrangement 42 accounts for the radial movement of the work engaging members 34 and 36. The stone assemblies 34 each include a work engaging member 44 having an abrasive portion 46 associated therewith, the work engaging member 44 being mounted on a backing member 48 which in turn is attached to or mounted on a support structure 50. In such a honing mandrel construction, the present anti-galling composite coating 28 could be applied over the bond already established

between the abrasive portion 46 and the member 44 to achieve the aforementioned objectives.

Referring again to Fig. 7, the guide assemblies 36 each include a backing or support portion 52 having a relatively non-abrasive upstanding work engaging member 54 projecting upwardly from the backing member 52 as shown. Since the guide assemblies 36 function to stabilize and provide backing for the hones on the mandrel 32 during a honing operation, the work engaging guide members 54 are preferably constructed of a relatively inexpensive malleable or ductile material such as materials that include zinc or zinc alloys which is characterized by being relatively non-abrasive and more likely to slide on a work surface than to abrade it. Zinc is also a relatively easy material to cast and is generally preferred although other relatively non-abrasive materials such as bronze, brass and certain plastic materials could be used for this application. Since shoe or guide assemblies make contact with the work surface to be honed, and since such assemblies are specifically designed to be as non-abrasive as possible, it is also anticipated and recognized that the present anti-galling composite coating 28 could likewise be applied over the top of the work engaging surface of the guide members 54 such as the work engaging guide surfaces 56 (Fig. 7) to even further reduce the friction coefficient of such surfaces. This provides a smooth, anti-stick, anti-galling coating over the top of the work engaging guide assembly and further ensures against the problems of galling and scoring of the honed work surface. Still other uses and applications of the present invention to provide anti-stick and anti-gall properties to a work engaging surface during a honing operation are recognized and anticipated.

Claims

1. A work abrading member, particularly honing member (10, 32) having an outer surface (16, 22) with abrasive particles (21) and a binder (24, 26) for attaching the abrasive particles thereto over a portion of a length thereof, said abrasive particles (21) defining the work engaging portion (18) of said member,
having a layer (28) of a composite material extending over and attached to a predetermined portion of the surface of said member between the abrasive particles (21) attached thereto, said composite material including a metallic material capable of bonding to said binder and non-abrasive lubricating type anti-stick material, characterized in that said layer is about 1 µm to about 50 µm thin, said non-abrasive lubricating type anti-stick material being present in said composite material in a range of about 10% to about 25% so as to form a substantially smooth continous friction free surface between said abrasive particles (21), which prevents metal chips and shavings produced during an abrading operation from building up and collecting on such surface between the abrasive particles, the overall thickness of the binder and the layer of composite material in combination being between 50% and 90% of the abrasive particle height.

2. Member according to claim 1, wherein said layer of a composite material has a thickness of about 5 µm to about 13 µm.

3. Member according to claim 1 or 2, wherein said metallic material is selected from the group consisting of nickel, nickel-phosphorous, nickel-boron, nickel chromium, copper, cobalt, chromium, and aluminium.

4. Member according to one of the preceding claims, wherein said non-abrasive lubricating type anti-stick material is selected from the group consisting of polytetrafluorethylene, molybdenum disulfide, mica, and graphite.

5. Member according to claim 3 and 4, wherein said composite material is a metal/polytetrafluoroethylene material.

6. Member according to claim 3 and 4, wherein said composite material is a nickel/phophorous alloy having micron-sized polytetrafluoroethylene particles occluded therein.

7. Member according to one of the claims 1 to 6, wherein said abrasive particles (21) include particles of superabrasive material.

8. Member according to claim 7, wherein said abrasive particles include diamond particles and/or particles of cubic boron nitride.

9. Use of a composite material including a metallic material capable of bonding to a binder and non-abrasive lubricating type anti-stick material being present in said composite material in a range of about 10% to about 25% so as to form a substantially smooth continous friction free surface wherein said composite material is preferably a metal/polytetrafluoroethylene material or a nickel/phophorous alloy having micron-sized polytetrafluoroethylene particles occluded therein, as a coating over the non-abrasive work engaging surface (56) of a honing guide assembly (36), which coating has a thickness of about 1 µm to about 50 µm, preferably of about 5 µm to about 13 µm.

10. A method for attaching abrasive particles (21) onto the surface (16, 22) of a work abrading member (10, 32), particularly a honing member, by attaching said abrasive particles (21) to the surface (16, 22) of the member (10, 32) so as to establish a predetermined bond (24, 26) therebetween, whereby a

layer (28) of a composite material comprising a metallic material and a non-abrasive lubricating type anti-stick material is coated over the top of said bond (24, 26), said metallic material being capable of bonding with said predetermined bond (24, 26), characterized in that said layer is about 1 µm to about 50 µm thin and said non-abrasive lubricating type anti-stick material being present in said composite material in the range from about 10% to 25% to form a substantially smooth continous friction free plane of material over the top of said bond (24, 26) between the abrasive particles which functions as a lubricating surface to provide anti-stick and anti-gall properties to said composite material preventing metal chips and shavings produced during an abrading operation from adhering to such surface, the overall thickness of the predetermined bond and the layer of composite material in combination being between 50% and 90% of the abrasive particle height.

11. A method according to claim 10, wherein the composite material is coated over the top of said bond (24, 26) by electroless plating.

12. A method according to claim 10 or 11, wherein a metal/ polytetrafluoroethylene composite material is used as composite material.

13. A method according to claim 12, wherein a nickel/ polytetrafluoroethylene composite material is used as composite material.

14. A method according to claim 11, wherein a nickel/ phosphorous alloy material having micron-sized polytetrafluoroethylene particles occluded therein is used as the nickel/polytetrafluoroethylene composite material.

15. A method according to one of the claims 10 to 14, wherein polytetrafluoroethylene is used as said non-abrasive lubricating type anti-stick material.

16. A method according to one of the claims 10 to 15, wherein diamond particles and/or particles of cubic boron nitrite are used as abrasive particles.

17. A method according to one of the claims 10 to 16, wherein said abrasive particles (21) are attached to the surface (16, 22) of the member (10, 32) by means of a metal plating process.

18. A method according to claim 17, wherein said metal plating process is an electroplating process.

Patentansprüche

1. Werkstückschleifelement, insbesondere Honelement (10, 32), das eine Außenfläche (16, 22) mit Schleifpartikeln (21) und einem Bindemittel (24, 26) aufweist, mit dem die Schleifpartikel auf einem Teil ihrer Länge an ihr befestigt werden, wobei die Schleifpartikel (21) den Werkstückeingriffsabschnitt (18) des Elementes bilden, sich eine Schicht (28) aus einem Verbundwerkstoff über einem vorher bestimmten Abschnitt der Oberfläche des Elements zwischen den daran befestigten Schleifpartikeln (21) erstreckt und daran befestigt ist, und der Verbundwerkstoff einen Metallwerkstoff enthält, der sich mit dem Bindemittel und einem nichtschleifenden schmierenden Antihaftwerkstoff verbinden kann, dadurch gekennzeichnet, daß die Schicht ungefähr 1 um bis ungefähr 50 um dünn ist und der nichtschleifende schmierende Antihaftwerkstoff einen Anteil von ungefähr 10% bis 25% in dem Verbundwerkstoff hat, um eine im wesentlichen glatte, fortlaufende reibungsfreie Oberfläche zwischen den Schleifmitteln (21) zu bilden, die einen Aufbau und eine Ansammlung von Metallsplittern und -spänen, die während des Schleifens erzeugt werden, auf einer solchen Oberfläche zwischen den Schleifpartikeln verhindert, wobei die Gesamtdicke des Bindemittels und der Schicht aus Verbundwerkstoff zusammen zwischen 50% und 90% der Schleifpartikelhöhe beträgt.

2. Element nach Anspruch 1, bei dem die Schicht aus einem Verbundwerkstoff eine Dicke von ungefähr 5 µm bis ungefähr 13 µm hat.

3. Element nach Anspruch 1 oder 2, bei dem der Metallwerkstoff aus einer Gruppe ausgewählt ist, die Nickel, Nickelphosphor, Nickelbor, Nickelchrom, Kupfer, Kobalt, Chrom und Aluminium enthält.

4. Element nach einem der vorhergehenden Ansprüche, bei dem der nichtschleifende schmierende Antihaftwerkstoff aus einer Gruppe ausgewählt ist, die Polytetrafluorethylen, Molybdändisulfid, Glimmer und Graphit enthält.

5. Element nach Anspruch 3 und 4, bei dem der Verbundwerkstoff ein Metall/Poytetrafluorethylen-Werkstoff ist.

6. Element nach Anspruch 3 und 4, bei dem der Verbundwerkstoff eine Nickel/Phosphorlegierung ist, in der Polytetrafluorethylenpartikel in Mikrometergröße eingeschlossen sind.

7. Element nach einem der Ansprüche 1 bis 6, bei dem die Schleifpartikel (21) Partikel aus einem superschleifenden Material enthalten.

8. Element nach Anspruch 7, bei dem die Schleifpartikel Diamantpartikel und/oder Partikel aus kubischem Bornitrid enthalten.

9. Verwendung eines Verbundwerkstoffs, der einen Metallwerkstoff enthält, der sich mit einem Bindemittel und einem nichtschleifenden schmierenden Antihaftwerkstoff verbinden kann, der in dem Verbundwerkstoff in einer Größenordnung von ungefähr 10% bis ungefähr 25% enthalten ist, um eine im wesentlichen glatte, fortlaufende reibungsfreie Oberfläche zu bilden, wobei der Verbundwerkstoff vorzugsweise ein Metall/Polytetrafluorethylenwerkstoff oder eine Nickel/Phosphorlegierung ist, in der Polytetrafluorethylenpartikel in Mikrometergröße eingeschlossen sind, als Beschichtung über der nichtschleifenden Werkstückeingriffsfläche (56) einer Honführungsanordnung (36), wobei die Beschichtung eine Dicke von ungefähr 1 µm bis ungefähr 50 µm, vorzugsweise ungefähr 5 µm bis ungefähr 13 µm hat.

10. Verfahren zur Befestigung von Schleifpartikeln (21) auf der Oberfläche (16, 22) eines Werkstückschleifelements (10, 32), insbesondere eines Honelements, bei dem die Schleifpartikel (21) so auf der Oberfläche (16, 22) des Elements (10, 32) befestigt werden, daß eine vorher bestimmte Verbindung (24, 26) zwischen ihnen hergestellt wird, wobei die Oberseite der Verbindung (24, 26) mit einer Schicht (28) aus einem Verbundwerkstoff beschichtet wird, der einen Metallwerkstoff und einen nichtschleifenden schmierenden Antihaftwerkstoff enthält, und der Metallwerkstoff sich mit der vorher bestimmten Verbindung (24, 26) verbinden kann, dadurch gekennzeichnet, daß die Schicht ungefähr 1 µm bis ungefähr 50 µm dünn ist und daß der nichtschleifende schmierende Antihaftwerkstoff in einer Größenordnung von ungefähr 10% bis ungefähr 25% in dem Verbundwerkstoff enthalten ist, um eine im wesentlichen fortlaufende reibungsfreie Werkstoffebene auf der Oberseite der Verbindung (24, 26) zwischen den Schleifpartikeln zu bilden, die als Schmierfläche zur Schaffung von Antihaft- und Antifresseigenschaften dient, damit ein Haften von Metallsplittern und Metallspänen, die während eines Schleifbetriebs erzeugt werden, auf einer solchen Oberfläche verhindert wird, wobei die Gesamtdicke der vorher bestimmten Verbindung und der Schicht aus Verbundwerkstoff zusammen zwischen 50% und 90% der Schleifpartikelhöhe beträgt.

11. Verfahren nach Anspruch 10, bei dem die Oberseite der Verbindung (24, 26) durch stromloses Plattieren mit dem Verbundwerkstoff beschichtet wird.

12. Verfahren nach Anspruch 10 oder 11, bei dem ein Metall/Polytetrafluorethylen-Verbundwerkstoff als Verbundwerkstoff verwendet wird.

13. Verfahren nach Anspruch 12, bei dem ein Nikkel/Polytetrafluorethylen-Verbundwerkstoff als Verbundwerkstoff verwendet wird.

14. Verfahren nach Anspruch 11, bei dem als Nikkel/Polyfluorethylen-Verbundwerkstoff eine Nikkel/Phosphorlegierung verwendet wird, in der Polytetrafluorethylenpartikel in Mikrometergröße eingeschlossen sind.

15. Verfahren nach einem der Ansprüche 10 bis 14, bei dem Polytetrafluorethylen als nichtschleifendes schmierendes Antihaftmaterial verwendet wird.

16. Verfahren nach einem der Ansprüche 10 bis 15, bei dem Diamantpartikel und/oder Partikel aus kubischem Bornitrit als Schleifpartikel verwendet werden.

17. Verfahren nach einem der Ansprüche 10 bis 16, bei dem Schleifpartikel (21) auf der Oberfläche (16, 22) des Elements (10, 32) mittels eines Metallplattierungsverfahrens befestigt werden.

18. Verfahren nach Anspruch 17, bei dem das Metallplattierverfahren ein Elektroplattierverfahren ist.

Revendications

1. Corps abrasif pour l'abrasion de pièces à usiner, particulièrement corps de honage (10, 32) comportant une surface extérieure (16, 22) munie de particules abrasives (21) et d'un liant (24, 26) pour fixer les particules abrasives à cette surface sur une partie de sa longueur, lesdites particules abrasives (21) définissant la partie (18) d'attaque de pièce dudit corps qui comporte une couche (28) d'un matériau composite s'étendant sur, et fixé à, une partie prédéterminée de la surface dudit corps entre les particules abrasives (21) qui y sont fixées, ledit matériau composite comprenant un matériau métallique capable d'adhérer audit liant et un matériau anti-adhésif du type lubrifiant non-abrasif caractérisé en ce que ladite couche a une épaisseur d'environ 1µm à environ 50µm, ledit matériau anti-adhésif du type lubrifiant non abrasif étant présent dans ledit matériau composite dans des proportions comprises entre environ 10% et environ 25% de manière à former, entre lesdites particules abrasives (21), une surface exempte de frottement, continue et sensiblement lisse, qui empêche les copeaux et les ébarbures métalliques produits pendant l'opération d'abrasion d'être recueillis et de s'accumuler sur la surface située entre les particules abrasives, l'épaisseur globale du liant et de la couche de matériau composite combinés étant comprise entre 50% et 90% de la hauteur des particules abrasives.

2. Corps selon la revendication 1, dans lequel ladite couche d'un matériau composite a une épaisseur comprise entre environ 5µm et environ 13 µm.

3. Corps selon la revendication 1 ou 2, dans lequel le matériau métallique est choisi parmi le groupe comprenant le nickel, le nickel-phosphore, le nickel-bore, le nickel-chrome, le cuivre, le cobalt, le chrome et l'aluminium.

4. Corps selon l'une quelconque des revendications précédentes, dans lequel ledit matériau anti-adhésif du type lubrifiant non abrasif est choisi parmi le groupe comprenant le polytétrafluoroéthylène, le disulfure de molybdène, le mica et le graphite.

5. Corps selon la revendication 3 ou 4, dans lequel ledit matériau composite est un matériau du type métal/polytétrafluoroéthylène.

6. Corps selon la revendication 3 ou 4, dans lequel ledit matériau composite est un alliage de nickel/phosphore dans lequel sont occluses des particules de polytétrafluoroéthylène de la taille du micromètre.

7. Corps selon l'une quelconque des revendications 1 à 6, dans lequel lesdites particules abrasives (21) comprennent des particules d'un matériau superabrasif.

8. Corps selon la revendication 7, dans lequel lesdites particules abrasives comprennent des particules de diamant et/ou des particules de nitrure de bore cubique.

9. Utilisation d'un matériau composite comprenant un matériau métallique capable d'adhérer à un liant et un matériau anti-adhésif du type lubrifiant non-abrasif présent dans ledit matériau composite dans des proportions comprises entre environ 10% et environ 25% de manière à former une surface exempte de frottement, continue et sensiblement lisse, ledit matériau composite étant de préférence un matériau du type métal/polytétrafluoroéthylène ou un alliage de nickel/phosphore, dans lequel sont occluses des particules de polytétrafluoroéthylène de la taille du micromètre, en tant que revêtement sur la surface non-abrasive (56) d'attaque de pièce à usiner d'un ensemble (36) formant guide de honage, ce revêtement ayant une épaisseur d'environ 1µm à environ 50µm, de préférence d'environ 5µm à environ 13µm

10. Procédé pour fixer des particules abrasives (21) sur la surface (16, 22) d'un corps (10, 32) pour l'abrasion d'une pièce à usiner, particulièrement un corps de honage, par fixation desdites particules abrasives (21) à la surface (16, 22) du corps (10, 32) de manière à établir une liaison prédéterminée (24, 26) entre ces particules et cette surface, une couche (28) d'un matériau composite comprenant un matériau métallique et un matériau anti-adhésif du type lubrifiant non-abrasif est déposé sur le dessus de ladite liaison (24, 26), ledit matériau métallique étant capable d'établir une liaison avec ladite liaison prédéterminée (24, 26), caractérisé en ce que ladite couche a une épaisseur comprise entre environ 1µm et environ 50µm et ledit matériau anti-adhésif, du type lubrifiant et non abrasif, étant présent dans ledit matériau composite dans des proportions d'environ 10% à 25% de manière à former sur le dessus de ladite liaison (24, 26), entre les particules abrasives, un plan continu et sensiblement lisse, exempt de frottement, qui joue le rôle d'une surface lubrifiante pour donner audit matériau composite des propriétés d'anti-adhérence et d'anti-grippage qui empêchent les copeaux et les ébarbures métalliques, produits pendant une opération d'abrasion, d'adhérer à cette surface, l'épaisseur globale de la liaison prédéterminée en combinaison avec la couche de matériau composite étant comprise entre 50% et 90% de la hauteur des particules abrasives.

11. Procédé selon la revendication 10, dans lequel on dépose le matériau composite sur le dessus de ladite liaison (24, 26) par dépôt chimique.

12. Procédé selon la revendication 10 ou 11, dans lequel on utilise un matériau composite du type métal/polytétrafluoroéthylène comme matériau composite.

13. Procédé selon la revendication 12, dans lequel on utilise un matériau composite du type nickel/plytétrafluoroéthylène comme matériau composite.

14. Procédé selon la revendication 11, dans lequel on utilise un alliage de nickel/phosphore dans lequel sont occluses des particules de polytétrafluoroéthylène de la taille du micromètre comme matériau composite du type nickel/polytétrafluoroéthylène.

15. Procédé selon l'une quelconque des revendications 10 à 14, dans lequel on utilise du polytétrafluoroéthylène comme matériau anti-adhésif du type lubrifiant et non-abrasif précité.

16. Procédé selon l'une quelconque des revendications 10 à 15, dans lequel on utilise des particules de diamant et/ou des particules de nitrure de bore cubique comme particules abrasives.

17. Procédé selon l'une quelconque des revendications 10 à 16, dans lequel on fixe lesdites particules abrasives (21) à la surface (16, 22) du corps (10, 32) au moyen d'un processus de dépôt de métal.

18. Procédé selon la revendication 17, dans lequel ledit processus de dépôt de métal est un processus d'électrodéposition.

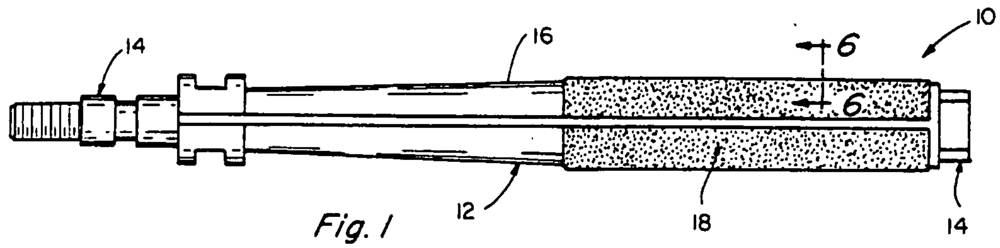

Fig. 1

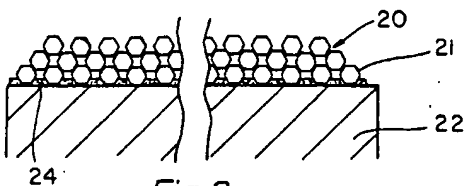

Fig. 2

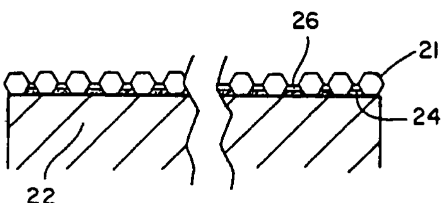

Fig. 3

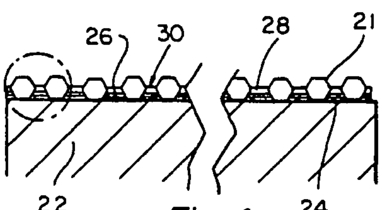

Fig. 4

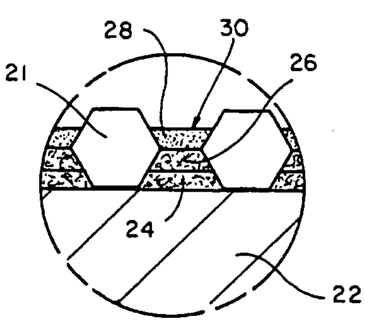

Fig. 5

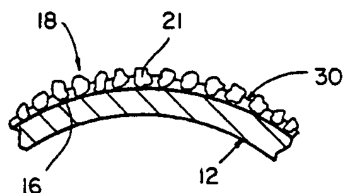

Fig. 6

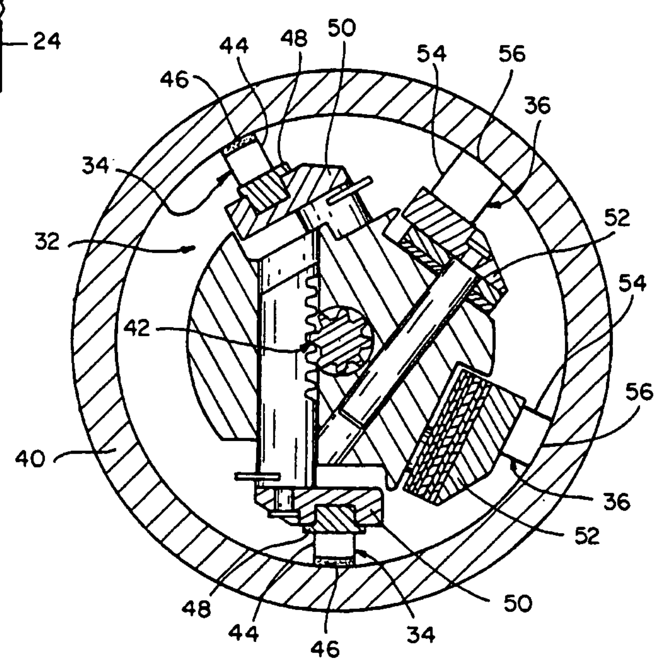

Fig. 7